THE EFFECTS OF TEACHER-DETERMINED AND STUDENT-DETERMINED CONTINGENCIES OF REINFORCEMENT ON ACADEMIC RESPONSE RATE

By

JEFFREY FRANCIS KANOV

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To my parents, Theodore and Selma Kanov

The social environment is obviously man-made--it generates the language a person speaks, the customs he follows, and the behavior he exhibits with respect to the ethical, religious, governmental, economic, educational, and psychotherapeutic institutions which control him. The evolution of a culture is in fact a kind of gigantic exercise in self-control. As the individual controls himself by manipulating the world in which he lives, so the human species has constructed an environment in which its members behave in a highly effective way. Mistakes have been made, and we have no assurance that the environment man has constructed will continue to provide gains which outstrip the loses, but man as we know him, for better or for worse, is what man has made of man.

--B. F. Skinner, 1971

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Abstract of Dissertation Presented to the Graduate Council
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By

Jeffrey Francis Kanov

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Free operant technology was used to investigate the effects of teacher-determined and student-determined contingencies of reinforcement on academic response rate.

Seventy-two fourth graders were randomly assigned to four groups each containing eighteen subjects. Five nine-day treatment phases were used during which subjects did arithmetic addition problems for 10 minutes daily. Phase one, referred to as Baseline, was identical for all groups. Each subject was informed that his performance would be graded and that the results would be made available the following day.

In phase two, referred to as Token I, all subjects were informed that they could earn points for responding correctly which could be exchanged for money at the rate of one nickel for every 20 points earned. Subjects in groups one and two selected their own schedules of reinforcement and

reinforcer magnitudes from a reinforcement menu which contained points (from 0 to 5) and fixed-ratio schedules of reinforcement (from 10 to 50 responses, by tens). The consequences of contingency selection were fully explained to each subject by his teacher.

Subjects in groups three and four were assigned contingencies by their teachers. In order to insure that each group received the same average reinforcer magnitude and reinforcement schedule, subjects in groups three and four were randomly yoked to subjects in groups one and two. Thus, if a subject in group one selected five points for each 10 correct responses, his yoked partner in group three was assigned the same contingencies by his teacher. Each subject was informed of the number of points earned on the following day and was allowed to exchange points for nickels on the last day of Token I.

Phase three, referred to as Extinction I, was a replication of Baseline for all groups. No planned reinforcement was administered. In phase four, referred to as Token II, subjects in groups one and four selected their own contingencies. Subjects in groups two and three were yoked to subjects in groups one and four, and the teachers determined the contingencies. Phase five, referred to as Extinction II, was a replication of Baseline for all groups.

Results of statistical analyses of correct response rates showed nonsignificant between-group and interactional effects. However, significant differences were found across treatment phases within each group. Similar analyses of incorrect response rates resulted in nonsignificant main and interactional effects.

The results demonstrated that student-determined reinforcement and teacher-determined reinforcement were equally effective in terms of accelerating correct response rate but that Token I treatment was less effective than Token II treatment since groups one and three each did not differ significantly between Baseline and Token I. It was also seen that different reinforcement histories, in terms of the contingency manager, did not produce significant between-group differences in correct responding during subsequent teacher-determined reinforcement, student-determined reinforcement and extinction treatments but that subjects with histories of teacher-management followed by self-management (group four) emitted significantly more correct responses during Extinction II in comparison to Baseline, Token I, and Extinction I.

Additional findings showed that (1) considerable acceleration in correct responding occurred during Token II following the introduction of an extinction treatment between Token I and Token II, (2) discontinuing reinforcement did not result in significant decelerations in correct responding during extinction conditions when compared to responding during reinforcement conditions, (3) every subject who selected his own contingencies chose the richest

schedule of reinforcement and the greatest reinforcer magnitude, and (4) that correct and incorrect responses functioned as concurrent operants since reinforcing correct responding did not significantly affect incorrect responding.

Chapter I

INTRODUCTION

Traditionally, educators have been concerned with arranging contingencies of reinforcement in classroom instruction in order to produce individuals with rather complex repertoires of culturally valued behavior (Skinner, 1968). It was the teacher's responsibility to prescribe curricula, determine criteria for success, and dispense reinforcement contingent upon specific academic and social behaviors. Seldom, if ever, was the student invited to assist in arranging his own instructional environment.

Lovitt and Curtiss (1969) have pointed out that one of the prime objectives of our educational system is the management of one's own behavior. Similarly, Neisworth, Deno, and Jenkins (1969) have suggested that educational efforts should be directed toward helping students develop the self-control necessary for independent action. Homme, Csanyi, Gonzales, and Rechs (1969) concur with this notion and have maintained that

> Every conscientious teacher wants to do more than teach arithmetic, composition, geography, or whatever his subject matter is. He would also like to help students develop such attributes as self-control, initiative, and self-discipline (p. 44).

B. F. Skinner has done much to elucidate the issue of behavioral control. He has suggested that self-control is not a function of the strength or amount of an individual's "will" or some similar illusive power existing somewhere within him. Rather, when a man controls himself, he does so precisely as he would control the behavior of others. He manipulates the variables of which his behavior is a function. In other words, one is able to control his own behavior to the extent that he is able to do something about the variables affecting him.

According to Skinner,

> The traditional conception of what is happening when an individual controls himself has never been successful as an educational device. It is of little help to tell a man to use his "will power" or his "self-control." Such an exhortation may make self-control slightly more probable by establishing additional aversive consequences of failure to control, but it does not help anyone to understand the actual processes. An alternative analysis of the *behavior* of control should make it possible to teach relevant techniques as easily as any other technical repertoire (1953, p. 241).

If indeed one goal of education is to produce individuals capable of managing themselves effectively, certain characteristics of self-management (the behaviors leading to becoming a self-managing individual) must be identified. Lovitt and Curtiss (1969) have suggested that self-management of one's own behavior may involve (1) the self-assessment of competencies, (2) the ability to establish one's own behavioral goals, and (3) the ability to specify a set of contingencies whereby one might achieve these goals.

The present dissertation will concern itself with the third set of characteristics. Free operant techniques will be employed to examine the effects of student-determined and teacher-determined contigencies of reinforcement on academic response rate.

Related Research

Studies of Teacher-Determined Contingencies of Reinforcement

One of the first studies of the application of free operant technology in classroom instruction appeared in the early 1960s when Zimmerman and Zimmerman (1962) used differential teacher attending to improve spelling behavior in one child and eliminate tantrum behavior in another. These findings led to volumes of research utilizing the classroom teacher as a social reinforcer.

Several recent preschool studies have been concerned with the effect of social reinforcement on response rate. In an attempt to reduce the hyperactivity of a 4.5-year-old boy, teacher attention was delivered if the child engaged in one activity for at least one minute and withheld contingent upon all other behavior (Allen, Henke, Harris, Baer, and Reynolds, 1967). Results showed a significant increase in time spent on specific activities as a result of social reinforcement arranged by the teacher. Other preschool studies dealing with operant crying (Hart, Allen, Buell, Harris, and Wolf, 1964), isolate play (Allen, Hart, Buell, Harris, and Wolf, 1964), regressive crawling (Harris, Johnston, Kelley, and Wolf, 1964), and "obnoxious" behavior

(Hart, Reynolds, Baer, Brawley, and Harris, 1968) have also demonstrated the efficacy of social reinforcement in producing children with more appropriate repertoires of classroom behavior.

Social reinforcement provided by teachers has been found to be effective in a variety of settings. One setting badly in need of more effective management techniques is the public school classroom. Becker, Madsen, Arnold, and Thomas (1967) used contingent teacher attention and praise to reduce the disruptive behavior of two children in each of five classes. Hall, Lund, and Jackson (1968) reported an increase in study behavior as a result of the teacher ignoring disruptive behavior and praising on-task behavior of public school children. Madsen, Becker, and Thomas (1968) examined the effects of rules, ignoring, and praise in attempting to manage the behavior of an entire class of children. Results showed that rules alone were not effective. However, when the teacher praised appropriate behavior and ignored inappropriate responses, deviant behavior quickly declined.

To dramatize the effects of teacher attention on classroom behavior, Thomas, Becker, and Armstrong (1967) compared no-approval and frequent-disapproval treatments. Results showed a decrease in appropriate classroom behavior contingent upon the no-approval treatment. During the frequent-disapproval treatment, disruptive behaviors further increased demonstrating that teacher disapproval actually reinforced inappropriate classroom behavior.

Although social reinforcement has been found to be effective in modifying behavior, other reinforcers are also used. One of the most effective strategies in classroom management involves the use of token reinforcement. O'Leary and Becker (1967) used a token program to reduce the disruptive behavior of 17 children placed in a special class because of inappropriate social and academic behavior. Wolf, Giles, and Hall (1968) used a token program with children enrolled in a remedial program during the summer and after school. Academic gains at the end of one year for the token group were nearly twice those of a control group.

Token reinforcement has been used extensively with retarded children. Birnbrauer, Bijou, Wolf, and Kidder (1965) described a special education classroom for retarded children in which programmed instruction and token reinforcement were used successfully. Girardeau and Spradlin (1964) used tokens in a cottage program for retardates.

The Santa Monica Project, a program that utilized token reinforcement to modify the behavior of disruptive children, has demonstrated the salutary effects of teacher-determined contingencies of reinforcement on academic and social responding (Hewett, 1968). Results showed that greater task attention and significant gains in arithmetic could be achieved by adherence to what Hewett has called the Engineered Classroom, an instructional environment in which nine children are provided with a systematic educational program that reinforces successful academic and appropriate social behavior.

It should be apparent that the one variable common to all studies presented thus far is that in each it was the teacher who assumed complete responsibility for determining the parameters of the instructional environment. However, there appears to be a trend in education today to invite the student to assist in developing his own instructional program or at least certain aspects of it. The following studies and programs have been conducted to determine the efficacy of student management.

Two Systems of Self-Management

Neisworth, Deno, and Jenkins (1969) have proposed a system in which student motivation may be increased through more effective contingency management. In that system, a behavior-change target, either academic or social, is selected by the teacher, the immediate consequences of the behavior are examined and manipulated, and systematic records are kept on student progress. A reinforcement system in which tokens are assigned to tasks and to back-up reinforcers by the teacher is used to effect behavioral change.

The typical classroom procedure for each child is as follows: (1) The child enters the task area, (2) selects his assignment, (3) completes it, (4) requests a progress check by the teacher, (5) gets the check, (6) receives reinforcement if successful, (7) goes to the reinforcing event area, (8) pays tokens, (9) selects an event, (10) engages in the event for a specified period, and (11) returns to the task area to begin again at step two. If after a check at step five a student is not successful, he is assigned a remedial assignment and returns to step three.

The authors have suggested that ostensibly it may be difficult for some to view consequence management as a method for developing self-control in children. However, they point out that responsibility for selecting target behavior, record-keeping, and managing consequences can eventually be given to the student once he is properly trained. Unfortunately, a close examination of responsibilities in this system reveals that the student is still not permitted to select either the magnitude or the schedule of reinforcement under which he will respond. It therefore appears that the student will be allowed to "run" the system only after its dimensions and dynamics have been determined by the teacher and that he will not have an opportunity to select reinforcement magnitudes and schedules preferable to him.

Traditionally, negative contingencies have been used to motivate students to perform tasks determined by teachers. Children would work to avoid the ultimate aversive consequences of "not knowing" and the punishment of a low grade (Skinner, 1968). In other words, a type of contract was established with the student which stated: "In order to avoid punishment, you must successfully perform such-and-such a task."

All contracts need not be aversive. In a system similar to the one just presented, Homme, Csanyi, Gonzales, and Rechs (1969) use positive contingency contracting to motivate students and establish effective classroom control. Contracting takes the form: "As soon as you demonstrate that you have learned a little more, you may do something that is even more enjoyable" (p. 4). Thus, the student is reinforced by being allowed to engage in an activity that he enjoys once he has successfully completed a less desirable one. This procedure, of making a high-probability behavior contingent upon a behavior of lower probability, is commonly referred to as the Premack Principle (Premack, 1959) and has been found to be quite effective as a device for controlling classroom behavior (Homme, deBaca, Devine, Steinhorst, and Rickert, 1963).

One of the problems to which the above authors have addressed themselves involves moving from a teacher-managed contingency contracting system to one that is student-managed. In order to do this effectively, five transitional levels through which contracting proceeds are used. In level one, the teacher determines the magnitude of the reinforcer, the amount of work to be completed, and the delivery of reinforcement, while in level five, the student assumes complete control. Levels two through four serve as transitional steps in which the teacher systemically turns over control to the student allowing him to eventually specify the magnitude of the reinforcer for which he will work. Unfortunately, there is as yet no data to determine the efficacy of this program.

Studies of Student-Determined Contingencies of Reinforcement

Marston and Kanfer (1963) found that following an experimenter-administered reinforcement treatment phase, subjects exposed to subsequent self-administered and experimenter-administered reinforcement treatments emitted significantly greater frequencies of correct verbal discriminations when compared to a third group operating under nonreinforcement conditions. However, when compared with each other, the frequency of correct responses was significantly greater in the group in which reinforcement was experimenter-administered.

It should be pointed out that the differences found between self-administered and experimenter-administered reinforcement groups could have resulted not from differences in contingency managers but from problems stemming from the fact that it may have been more difficult for the subjects in the former group to determine if they did indeed respond correctly since they received no feedback as to correctness of responding. In phase one, the three groups were informed by the experimenter when a verbal discrimination was correct and were immediately reinforced by a flashing light. However, in phase two, subjects in the self-administered group were instructed to reinforce themselves with the light if they were fairly confident the response was correct. By simultaneously manipulating the contingency manager and the feedback as to whether or not a response was correct, it cannot safely be said that the variable responsible for differences between the two groups was the contingency manager. Finally, it must be pointed out that this study was concerned with the administration rather than the determination of contingencies of reinforcement.

In a study designed to examine the relative efficacy of self-monitored and externally imposed reinforcement systems, Bandura and Perloff (1967) found that the two systems were equally efficacious but that they sustained substantially more responsivity than did two control groups consisting of nonreinforcement and noncontingent reinforcement treatments. It was also reported that not one child selected the schedule with the most frequent reinforcement for himself and that about half self-prescribed the most austere ratio.

In this writer's opinion, the last finding could have been the result of a misunderstanding by the subjects as to what ratio would subsequently result in the highest "payoff." In an unpublished study, it was found that 19 of 20 third-grade children self-prescribed the richest schedules and magnitudes of reinforcement available to them when the schedules were thoroughly explained (Kanov, 1970).

In an investigation of the motivational properties of self-reinforcement, subjects were requested to match-to-sample stimuli that were presented tachistoscopically from four response choices (Kanfer and Duerfeldt, 1967). Three groups of subjects received 60 percent noncontingent reinforcement in phase one while a fourth group received no reinforcement during the experiment. In phase two, one group received continued noncontingent reinforcement externally (ER) while another group was given control over reinforcement delivery (SR). The third group received no reinforcement (EX). In phase three, no subjects were reinforced.

An analysis of correct responding has indicated that no significant group differences were found among the three groups during phases one and two. However, during phase three, the SR group emitted significantly more accurate recognitions than all other groups, suggesting that history of reinforcement can be instrumental in determining subsequent patterns of responding.

Lovitt and Curtiss (1969), in an examination of the effects of teacher-determined and student-determined contingencies on academic response rate, found that an increase in responding was associated with self-imposed contingencies. Unfortunately, the experimental treatments have resulted in the confounding of several independent variables thus making any attempt to identify the specific variables responsible for change a fruitless one. At best, all that can be said is that the simultaneous manipulation of the contingency manager, the magnitude of the reinforcer, and the schedule of reinforcement resulted in changes in response rate. Finally, it was learned that the median rates reported were a combination of correct and incorrect rates on several different academic subjects grouped under the rubric of academic response rate (Lovitt,1970). Naturally, if rates increased during the self-management phase only because the subject emitted a greater number of errors, the efficacy of self-management as depicted in the above study must be questioned.

In a study of classroom applications of self-determined reinforcement, self-determined, experimenter-determined, and chance-determined token reinforcement treatments were compared with a no-token treatment in terms of effect on the learning of ninth-grade geography and history curricula (Glynn, 1970). The distinction was made between determination and administration of reinforcement, and it was arranged for all subjects to self-administer earned tokens. Thus, the only independent variables were the amount of reinforcement (the number of tokens) and the "determiner" (the contingency manager).

Results have shown a similarity of initial baseline performances for all four classes along with an equal superiority of self-determined and experimenter-determined reinforcement conditions when compared with chance and no-token treatments. There was also a significant improvement from initial to final baseline for self-determined and experimenter-determined groups but not for the other two classes.

No significant differences in the number of tokens taken by the three classes during the first two token phases were reported. However, classes did differ in terms of amount of reinforcement in the third token phase with the self-determined class taking fewer tokens than the experimenter-determined class but more than the chance-reinforced class. Another interesting finding was that the self-determined class self-imposed the leanest ratios since their performance-token ratios were higher than the other groups for all three token phases. This observation supports a similar finding by Bandura and Perloff (1967) but runs counter to results obtained by Kanov (1970).

It should be apparent that after reviewing several studies of self-management, it is still not clear as to whether it matters, in terms of academic response rate, who determines the contingencies of reinforcement. This dissertation seeks to provide additional empirical data relevant to this still unanswered question.

Token Reinforcement

In the preschool studies presented earlier, teacher attention was found to be an effective reinforcer while in several other studies, tokens were used with success. Although social reinforcement was seen to be effective, it may not be reinforcing to some children nor may it be possible for a teacher to find time to personally attend to a child.

Birnbrauer and Lawler (1964) have confirmed that children vary in what is reinforcing to them. Some like candy and will work to receive it while others will not. The problem of selecting an effective reinforcer for a particular child can be overcome by using tokens as immediate reinforcers and back-up reinforcers in the form of money, candy, and privileges for which tokens may be exchanged. The tokens are identical for all children but derive their effectiveness from the individualized back-up reinforcers.

Sidman (1962) has suggested that the effectiveness of tokens as reinforcers will be a function of the variety and value of the back-up reinforcers. In addition, they are quite economical and do not interrupt ongoing activities as there is nothing to consume as with candy. Because of the many advantages of using tokens as reinforcers, such a system, using money as a conditioned generalized back-up reinforcer and points as tokens, was employed in the present study.

Free Operant Technology

The use of free operant technology is relatively recent in the field of psychology. In 1938, Skinner identified many of the learning principles that would eventually become the components of free operant research and subsequently precision teaching, a term coined by Lindsley (1968) to describe the application of operant techniques to classroom instruction.

For several years, operant methodology was used to study only animal behavior. Fuller (1949), using operant procedures to modify the behavior of a vegetative mental retardate, was one of the first to use these techniques with humans.

In 1953, Skinner introduced the notion of a science of human behavior and provided the framework for an experimental analysis of such behavior. Lindsley (1956) successfully applied this technology in his research with chronic schizophrenics while Bijou (1957) found similar success in studying patterns of reinforcement and resistance to extinction in children.

Edinger (1969) has pointed out that although free operant techniques were beginning to receive wide recognition in psychology and education, it was not until Lindsley (1964) presented a descriptive language designed to precisely describe behavior and its related variables that a systematic, standard methodology in human free operant research was developed. In free operant conditioning, rate of responding, the basic datum of the system, is altered by the arrangement of appropriate events delivered subsequent to a response (Lindsley, 1964). The individual is at all times "free" to emit any response,thereby minimizing methodological interactions with the behavior being studied. Another advantage is that the technique is exquisitely sensitive to subtle changes in rate thus permitting the study of single subjects. The reader is referred to a text by Kunzelmann, Cohen, Hulten, Martin, and Mingo (1970) for a more complete description and explanation of precision teaching.

Statement of Purpose

The purpose of this dissertation is to compare the effects of student-determined contingencies and teacher-determined contingencies of reinforcement on academic response rate.

Chapter II

METHOD

Subjects

Seventy-two fourth-grade children, thirty-six males and thirty-six females, from Oak Grove Elementary School in Dade County, Florida, participated in this study. The only criterion for selection was enrollment in the fourth grade.

Teachers

Three fourth-grade mathematics teachers at Oak Grove participated. One teacher-aide and a high school student participated as assistants.

Instructional Environment

All subjects in the present study met with their assigned math teachers for 45 minutes daily as part of their regular instructional programs. It was during this time that instruction pertaining to this research was conducted. The teaching climate for all students can therefore be described as good in that instruction relevant to this study was a regular part of each subject's regular math instruction.

Materials

The curriculum in the present study consisted of nine different arithmetic work sheets designed by the writer.

Each contained 80 addition problems with three 2-digit addends per problem. A copy of each work sheet is presented in Appendix A.

A reinforcement menu containing various numbers of points and schedules of reinforcement was also used and is presented in Appendix B. Daily recording forms and personal point records used to record data and provide feedback information to the subjects are presented in Appendix C.

Procedure

The subjects were randomly assigned to four groups. Although 88 subjects were initially selected, attrition due to withdrawal from school and changes in the regular school program resulted in a final total of 72 with 18 subjects per group.

On the first day of the study, the teachers distributed folders to each subject which contained 45 work sheets and recording forms. The subjects were instructed to remove the top sheet and calculate arithmetic problems until they were told to stop. At the end of a 10-minute period, the teachers collected the folders and regular classroom activities were resumed. The teachers informed the subjects before the work session that the extra arithmetic work would be graded and the results would be available the following day. Subjects were also told that their performance on the work sheets would be used in calculating their arithmetic report card grades. This phase of the study in which no experimental manipulations were performed is referred to as Baseline and continued for nine school days for each subject.

At the end of Baseline, subjects in groups one and two were informed by their teachers that they could earn points for responding correctly which could later be exchanged for money at the rate of one nickel for every 20 points earned. The teachers then showed each subject a reinforcement menu from which each was instructed to select his own schedule of reinforcement and reinforcer magnitude. The menu contained from 0 to 5 points for which each subject could choose to work. It also contained fixed-ratio schedules of reinforcement ranging from 10 to 50 responses, by tens, which each subject could select. In order to avoid any misunderstandings similar to those that might have occurred in the Bandura and Perloff study (1967) with regard to the tendency to select austere schedules and reinforcer magnitudes, each subject in groups one and two was informed of the possible consequences of his selection. This avoided the possibility of a subject desiring "most for least" choosing a schedule of FR 50 rather than FR 10, erroneously thinking that the higher the number, the bigger the "pay-off." In addition, it was also pointed out that choosing the most points would probably result in more points earned and, consequently, more nickels.

The second phase, referred to as Token I, lasted for nine days and was identical for groups one and two. The same instructional procedures outlined in Baseline were followed. However, when the work sheets were graded by the teacher-aide and the high school assistant, points were recorded for each subject on a personal point record sheet inserted in each folder. Thus, when folders were distributed the next day, each subject was able to see not only how many problems were computed correctly and incorrectly but also how many points were earned the previous day. Subjects were told that they would be allowed to exchange their points for nickels "in a few days." Actually, each subject made the exchange after the nine days of work in Token I phase had been completed.

Because of absences from school and changes in regular class scheduling, not all subjects began phase two at the same time nor did they receive their nickels simultaneously. Consequently, some students knew what procedures were to follow because they had missed one or two sessions.

Treatment in Token I was also identical for groups three and four. However, they differed from the other groups in that the teachers rather than the subjects deter- the contingencies of reinforcement. In order to insure that the only variable being manipulated between the first two and last two groups was the contingency manager, subjects in groups three and four were randomly yoked to subjects in groups one and two (Bandura and Perloff, 1967; Glynn, 1970). Thus, if subjects x and y in groups one and two selected FR 10 and FR 30 schedules and magnitudes of three and five points, respectively, their "partners" in groups three and four were assigned identical values by their teachers. In this way, all groups received identical schedules and reinforcer magnitudes.

The third phase of the study, referred to as Extinction I, was a replication of Baseline for all groups. No tokens or nickels were given for correct responding in this nine-day phase.

In phase four, referred to as Token II, subjects in groups two and three were allowed to select their own contingencies as did groups one and two during Token I. Groups one and four were yoked to groups two and three and the teachers selected the contingencies. Token II lasted for nine days.

The fifth phase of the study, referred to as Extinction II, was a replication of Baseline for all groups. It lasted for nine days and was the final phase of this experiment.

Experimental Design

In order to examine the effects of reinforcement history on subsequent performance under similar and different conditions, a within-subject design using each group as its own control seemed appropriate (Sidman, 1960). Thus, five experimental treatment phases were used which permitted comparisons of the performance of the same subjects under different treatment conditions. This design also permitted a between-subject analysis which provided answers to the effects of different contingency managers on response rate. The design is schematically presented in Figure 1.

Statement of the Problem

The teacher who intends to use self-management techniques in the classroom will want to know the answers to several questions before implementing such procedures. One basic question concerns the effects of student-determined reinforcement and teacher-determined reinforcement on correct academic response rate. Of equal interest are the effects of discontinuing reinforcement conditions on correct responding.

Since most educational systems today employ teacher management, an interesting question concerns the effects of teacher-determined reinforcement histories on correct response rate during either subsequent teacher-determined reinforcement or student-determined reinforcement treatments. Of equal interest are the effects of student-determined reinforcement histories on correct response rate during either subsequent teacher-determined reinforcement or student-determined reinforcement treatments. Finally, it would be interesting to examine the effects of different reinforcement histories on correct responding during a second extinction treatment.

	Treatment Phases				
Groups	Baseline	Token I	Extinction I	Token II	Extinction II
1	No planned reinforcement	Student-determined reinforcement	No planned reinforcement	Student-determined reinforcement	No planned reinforcement
2	No planned reinforcement	Student-determined reinforcement	No planned reinforcement	Yoked teacher-determined reinforcement	No planned reinforcement
3	No planned reinforcement	Yoked teacher-determined reinforcement	No planned reinforcement	Yoked teacher-determined reinforcement	No planned reinforcement
4	No planned reinforcement	Yoked teacher-determined reinforcement	No planned reinforcement	Student-determined reinforcement	No planned reinforcement

Fig. 1. A schematic illustration of the experimental design used in this study.

The issues just presented are condensed and summarized in the following seven questions:

1) What are the effects of student-determined and teacher-determined reinforcement treatments on correct academic response rate following a baseline condition?
2) What are the effects of student-determined and teacher-determined reinforcement histories on correct responding during a subsequent extinction treatment?
3) What are the effects of teacher-determined reinforcement histories on correct responding during either subsequent teacher-determined or student-determined reinforcement treatments?
4) What are the effects of student-determined reinforcement histories on correct responding during either subsequent teacher-determined or student-determined reinforcement treatments?
5) What are the effects of either teacher-determined or student-determined reinforcement histories on correct responding during subsequent student-determined reinforcement treatments?
6) What are the effects of either teacher-determined or student-determined reinforcement histories on correct responding during subsequent teacher-determined reinforcement treatments?

7) What are the effects of different reinforcement histories on correct responding during a second extinction treatment?

Chapter III

RESULTS

In preparing the data for analysis, it was decided to use the mean rate-correct score for each subject for each treatment phase rather than daily raw scores. Means were derived by separately summing each subject's daily rate-correct scores for each treatment phase and dividing each sum by nine, the number of days in each phase. This resulted in five mean rate-correct scores for each subject. Mean rate-correct scores for all subjects are presented in Appendix D. Grand means, derived by separately summing mean rate-correct scores for each group for each phase and then dividing each sum by 18, the number of subjects in each group, are presented in Table 1.

A Split-Plot Analysis of Variance (Kirk, 1968) was performed on mean rate-correct scores for all subjects across all treatment phases. The results, presented in Table 2, indicate no significant between-group or interactional differences but do show significant within-group differences across treatment phases.

Baseline

Results presented in Table 2 show a nonsignificant between-groups effect. Thus, the four groups can be said to be similar in terms of correct response rate during Baseline.

TABLE 1

Grand Mean Rate-Correct Scores for All Groups and Phases

	Phases				
Groups	Baseline	Token I	Extinction I	Token II	Extinction II
1	2.494	3.190	2.943	4.044	3.342
2	2.383	3.165	3.154	3.954	3.756
3	2.472	3.129	3.045	4.313	3.630
4	2.493	3.365	3.273	4.457	4.222

TABLE 2

A Split-Plot Analysis of Variance of Correct Response Rates for All Groups and Phases

Source	SS	df	MS	F
Groups	6.47	3	2.156	.161
Subj w. groups	908.59	68	13.361	
Phases	123.75	4	30.937	47.816*
Phases x groups	5.75	12	.479	.740
Phases x subj w. groups	175.99	272	.647	
Total	1220.55	359		

$^*p < .01$.

Token I

Results presented in Table 2 indicate no significant between-group differences during Token 1 as a function of different contingency managers. In order to locate the sources of significant within-group differences, grand mean rate-correct scores for each group were treated with Tukey's HSD Test (Kirk, 1968). The results, presented in Table 3, show that although there was considerable acceleration in correct responding within each group from Baseline to Token I, only in groups two and four were the differences statistically significant. In order to more easily see these differences, daily mean rate-correct and rate-incorrect scores for each group across each treatment phase are presented graphically in Figure 2. Grand means are indicated by horizontal lines within each phase.

Extinction I

Results presented in Table 2 indicate no significant between-group differences in correct responding as a function of different contingency-manager histories. To examine the effects of terminating reinforcement contingencies on correct response rate previously maintained by either teacher-determined or student-determined reinforcement contingencies, grand mean rate-correct scores for Baseline, Token I,and Extinction I were separately compared for each group using Tukey's HSD Test.

TABLE 3

Tukey HSD Tests for Differences in Correct Response Rate Among All Phases for All Groups

Groups	Grand means		Difference scores				
			X_1	X_3	X_2	X_5	X_4
1	X_1	2.494		.449	.696	.848*	1.550**
	X_3	2.943			.247	.399	1.101**
	X_2	3.190					.854*
	X_5	3.342					.702
	X_4	4.044					
2	X_1	2.383		.771*	.782*	1.373**	1.571**
	X_3	3.154			.011	.602	.800*
	X_2	3.165				.591	.789*
	X_5	3.756					.198
	X_4	3.954					
3	X_1	2.472		.573	.657	1.158**	1.841**
	X_3	3.045			.084	.585	1.268**
	X_2	3.129				.501	1.184**
	X_5	3.630					.683
	X_4	4.313					
4	X_1	2.493		.780*	.872*	1.729**	1.964**
	X_3	3.273			.092	.949**	1.184**
	X_2	3.365				.862*	1.092**
	X_5	4.222					.235
	X_4	4.457					

*$p < .05$.
**$p < .01$.

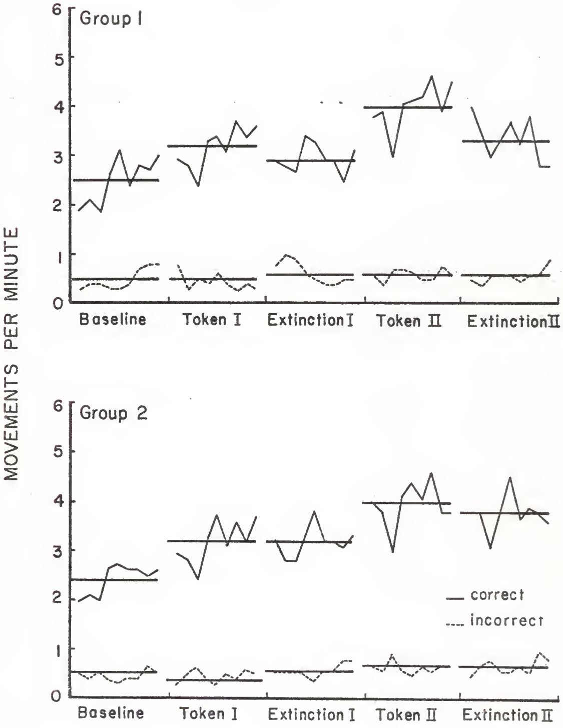
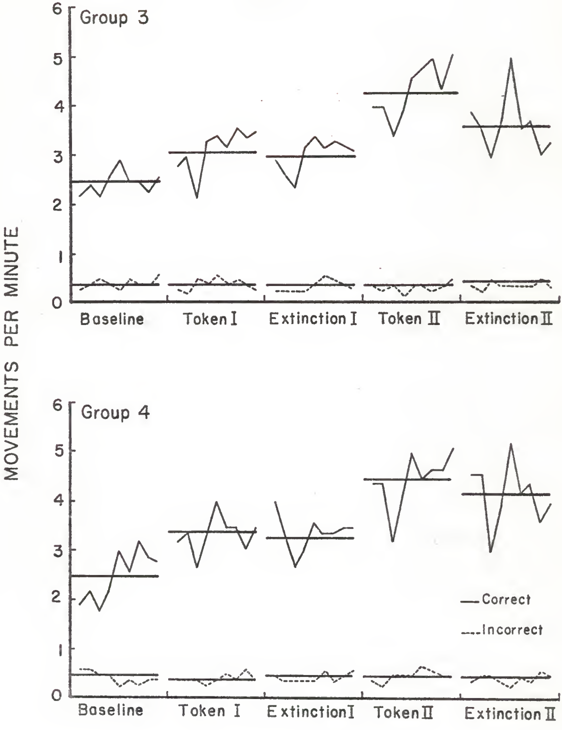


Fig. 2. Daily mean rate-correct and rate-incorrect performance for all groups for all phases.


MOVEMENTS PER MINUTE
Group 3
6
5
4
3
2
1
0
Baseline
Token I
Extinction I
Token II
Extinction II
Group 4
6
5
4
3
2
1
0
Baseline
Token I
Extinction I
Token II
Extinction II
— Correct
---- Incorrect

Results presented in Table 3 show nonsignificant differences among the first three phases for groups one and three. However, significant differences are seen between Baseline and Extinction I but not between Token I and Extinction I for groups two and four. One common finding was that in no group were response rates significantly different as a result of terminating reinforcement conditions during Extinction I when compared to Token I. Differences among the first three phases for each group are more easily seen by referring to Figure 2.

Token II

Results presented in Table 2 indicate no significant between-group differences in correct responding during a second reinforcement treatment as a function of either teacher-determined or student-determined reinforcement histories. It can therefore be concluded that because of nonsignificant differences between groups one and two during Token II, a history of student-determined reinforcement does not significantly affect correct responding during subsequent teacher-determined versus student-determined reinforcement treatments. Similarly, it can also be concluded that because of nonsignificant differences between groups three and four during Token II, a history of teacher-determined reinforcement does not significantly affect correct responding during subsequent teacher-determined versus student-determined reinforcement treatments.

Results presented in Table 2 further suggest that because of nonsignificant differences between groups one and four during Token II, teacher-determined versus student-determined reinforcement histories do not significantly affect correct responding during subsequent student-determined reinforcement treatments. Similarly, it can also be concluded that because of nonsignificant differences between groups two and three during Token II, teacher-determined versus student-determined reinforcement histories do not significantly affect correct responding during subsequent teacher-determined reinforcement treatments.

In order to examine the effects of student-determined reinforcement histories on correct response rate during subsequent teacher-determined and student-determined reinforcement treatments, Tukey's HSD Test was used to compare Token II with Baseline, Token I, and Extinction I for groups one and two. Results presented in Table 3 indicate significant differences for each of the three comparisons in both groups. In each case, differences resulted from an acceleration in correct responding during Token II.

In order to examine the effects of teacher-determined reinforcement histories on correct response rate during subsequent teacher-determined and student-determined reinforcement treatments, Tukey's HSD test was used to compare Token II with Baseline, Token I, and Extinction I for groups three and four. Results presented in Table 3 indicate significant differences for each of the three comparisons in both groups. Again, in each case, differences resulted from an acceleration in correct responding during Token II.

An examination of the within-group results just presented indicates that Token II treatment produced significantly higher rates of correct responding when compared to (1) an initial baseline treatment, (2) the first token reinforcement treatment, and (3) an extinction treatment. It is also interesting to note that although groups one and three did not significantly differ from Baseline, the first nonreinforcement treatment phase, to Token I, the first token treatment phase, each did differ significantly from Extinction I, the first extinction treatment phase, to Token II, the second token treatment phase. Of equal interest is the finding that reinstating contingencies in Token II resulted in significantly higher rates of responding when compared to Token I. Differences among the first four phases for each group are easily seen in Figure 2.

Extinction II

Results presented in Table 2 indicate no significant between-group differences in correct responding during a second extinction treatment phase as a function of different contingency-manager histories. To examine within-group differences for each group as a result of a second extinction treatment, Extinction II was compared with each preceding phase for each group using Tukey's HSD Test.

Results presented in Table 3 show significant differences only between Extinction II and Baseline for groups one through three. In group four, significant differences were found between Extinction II and Baseline, Token I, and Extinction I, but not between Extinction II and Token II.

In a comparison of Baseline and Extinction II for each group, correct responding during the latter phase was significantly higher in each group. Also, terminating reinforcement conditions for each group during Extinction II did not result in significant decelerations in correct responding when compared to Token II, corroborating an earlier finding of nonsignificant differences as a function of terminating reinforcement conditions during Extinction I when compared to Token I for each group. Differences among all treatment phases are seen in Figure 2.

Incorrect Response Rate

The preparation of incorrect response rates for analysis was identical to data preparation of correct rates. Mean rate-incorrect scores for all subjects are presented in Appendix E. Grand means are presented in Table 4.

In order to determine the effects of different experimental treatments on incorrect response rate, mean rate-incorrect scores were treated with a Split-Plot Analysis of Variance. The results, presented in Table 5, indicate

TABLE 4

Grand Mean Rate-Incorrect Scores for All Groups and Phases

Groups	Baseline	Token I	Extinction I	Token II	Extinction II
1	.474	.457	.612	.607	.573
2	.529	.437	.637	.666	.691
3	.424	.422	.407	.364	.409
4	.522	.394	.454	.488	.461

TABLE 5

A Split-Plot Analysis of Variance of Incorrect Response Rates for All Groups and Phases

Source	SS	df	MS	F
Groups	1.86	3	.620	.844
Subj w. groups	49.97	68	.734	
Phases	.59	4	.147	1.597
Phases x groups	.82	12	.068	.739
Phases x subj w. groups	25.29	272	.092	
Total	78.53	359		

nonsignificant between-group, within-group, and interactional effects. Thus, it can safely be concluded that reinforcing correct responding does not significantly affect incorrect responding and that correct and incorrect responding are independent behaviors. Results presented in Figure 2 illustrate this conclusion.

Chapter IV

DISCUSSION

Efficacy of Student-Determined Reinforcement

Results of the present study indicate that student-determined reinforcement and teacher-determined reinforcement are equally effective in terms of accelerating correct academic response rate. These results are consistent with those of Bandura and Perloff (1967) and Glynn (1970) but do not confirm those of Lovitt and Curtiss (1969). It should be pointed out that Bandura and Perloff used more than 70 subjects as did the present study while Glynn used 128. Lovitt and Curtiss used only 1 subject.

It is also interesting to note that in the present study, every subject who was required to select his own reinforcement contingencies chose the richest schedule of reinforcement and the greatest reinforcer magnitude (five points for each 10 correct responses). This finding runs counter to those of Bandura and Perloff (1967) and Glynn (1970), who found that subjects tended to select leaner schedules of reinforcement when given a choice. Perhaps this discrepancy resulted from the fact that in the present study, all subjects had a better understanding of the consequences of their choices prior to contingency selection.

The fact that reinforcer magnitudes and schedules were identical for each subject in the present study obviated the need for the yoked procedure outlined earlier. This resulted in a more precise examination of the effects of the contingency manager than the one achieved by Lovitt and Curtiss (1969).

Results also show that Token I treatment was less effective than Token II treatment as groups one and three each did not significantly differ between phases one and two. However, this may have been a function of the experimental design used in this study. The fact that considerable acceleration occurred during the last few days of Token I in groups one and three lends support to the notion that significant differences might have been seen had the number of days per treatment phase been greater.

Reinforcement History

Findings from the present study show that different reinforcement histories, in terms of the contingency manager, do not produce significant between-group differences in correct responding during subsequent teacher-determined reinforcement, student-determined reinforcement, and extinction treatments. However, within-group comparisons of Extinction II to each of the first four phases do show that subjects with reinforcement histories of teacher-management followed by self-management (group four) tend to emit significantly more correct responses during Extinction II in comparison to Baseline, Token I,and Extinction I. Although all groups showed significant differences in correct responding between Baseline and Extinction II, a finding also reported by Glynn (1970), only in group four were differences between Extinction II and Token I and Extinction II and Extinction I significant. This finding is similar to the one reported by Kanfer and Duerfeldt (1967), who found that a history of experimenter-administered reinforcement followed by self-reinforcement resulted in greater rates of correct responding during extinction in comparison to other treatments.

Between-group comparisons clearly suggest that students will perform as well regardless of who has previously determined reinforcement contingencies. Within-group results seem to suggest that students with histories of teacher-management and then self-management tend to emit significantly greater rates of correct responses during extinction in comparison to earlier responding under different treatments.

Results also show that introducing an extinction treatment between two token reinforcement treatments tends to reliably accelerate correct responding during the second token treatment. Although the procedure of generating higher rates of responding by temporarily introducing planned periods of extinction is common in the laboratory, the notion of inserting planned extinction treatments into an ongoing token economy deserves a thorough investigation.

Performance During Extinction

Findings from the present study show that terminating reinforcement does not result in significant decelerations in correct response rate during extinction. This corroborates Glynn's (1970) finding that students do not develop a dependency upon token reinforcement and are able to perform as well after it has been withdrawn. In fact, Edinger (1969) found that terminating an accelerating consequence following correct programmed reader responses accelerated subsequent correct responding.

Although many researchers have examined the effects of extinction on response rate previously maintained by different schedules of reinforcement (Ferster and Skinner, 1957), apparently few have investigated the effects of histories of extinction on response rate during subsequent reinforcement conditions. As mentioned earlier, the effects of extinction on subsequent responding under different contingencies are worthy of systematic exploration.

Incorrect Response Rate

Results of the present study show that reinforcing correct responses does not significantly affect incorrect response rate. It might therefore be concluded that correct and incorrect responses are concurrent operants and function independently (Catania, 1967). Ferster and Skinner (1957) have defined concurrent operants as "two or more responses, of different topography at least with respect to locus, capable of being executed with little mutual interference at the same time or in rapid alternation, under the control of separate programming devices" (p. 728). The concurrent nature of correct and incorrect responses was also found by Edinger (1969) although he reported that consequating correct responding resulted in a simultaneous deceleration of incorrect response rate. It is evident that further research involving the relationship between correct and incorrect responding is needed.

Methodological Considerations

The present study used four groups which were exposed to five experimental treatments. A fifth group used as a control group receiving no reinforcement would have contributed additional information with regard to the effects of practice on response rate.

It is an open question as to whether the length of each treatment phase affected the results. Nevertheless, determination of the number of days per phase appears to be an extremely important factor in developing an experimental design and deserves particular consideration. This problem might have been avoided had steady-state criteria been used to determine phase changes rather than predetermined time periods (Sidman, 1960).

Another consideration with respect to future research concerns the curriculum used in the present study. It was noted that several subjects occasionally finished their work sheets before the allotted 10 minutes had expired.

This not only presented problems for the teachers (they had to separately record the time for each subject who finished early) but, more importantly, may have been a reinforcer which, especially during extinction, may have maintained high rates of responding. A solution would be to either use shorter time periods or increase the number of arithmetic problems to insure that no one completes the work in the allotted time. The effects of length-of-assignment on rate of responding deserve a thorough, systematic investigation.

It is an open question as to whether results obtained in the present study would be replicated if different reinforcers, schedules, and immediate rather than delayed feedback were used. Similarly, it is left to be determined whether these results will be replicated with children of different grade levels, backgrounds, or exceptionalities.

Implications for Teachers

Results of the present study show that token reinforcement reliably accelerates correct responding no matter who determines reinforcement contingencies. Thus, the teacher who has little or no time to arrange contingencies can turn this responsibility over to the student with considerable assurance that academic performance will not be adversely affected, while the children will gain experience in managing a part of their educational environment.

It is also important for the teacher to know that token reinforcement does not produce students who become dependent upon the reinforcer. In fact, the creative teacher could employ planned periods of extinction to generate higher rates of responding once reinforcement is reintroduced. This would not only conserve reinforcers but would minimize the possibility of satiation.

It was also seen that different reinforcement histories do not result in significant between-group differences during subsequent treatments although a history of teacher-management followed by student-management produces rather salutary effects on correct responding during extinction. These findings lend support to the efficacy of token programs such as those proposed by Neisworth et al. (1969) and Homme et al. (1969).

Teachers should be aware of the concurrent nature of correct and incorrect responding and should treat errors as a separate class of behaviors. It would therefore be advantageous for teachers to establish contingencies that would not only accelerate correct responding but would also decelerate incorrect responding. A system employing response cost (point loss per response) to decelerate errors could easily be developed and introduced into a token economy (Weiner, 1962). In fact, Edinger (1969) found response cost particularly effective in decelerating incorrect programmed reader responding especially when correct responding was simultaneously reinforced.

APPENDICES

APPENDIX A

Arithmetic Work Sheets

Name____________________________ Date____________ Performance 1

46 26 56	37 48 84	68 74 59	89 66 67	37 38 33	44 59 26	72 28 52	38 33 72	56 55 43	33 47 58
67 36 63	45 56 62	52 28 55	87 35 22	69 44 76	45 25 58	67 33 39	55 57 33	33 77 40	42 48 50
72 49 53	38 44 42	55 26 26	78 35 47	69 42 66	43 37 38	35 47 89	42 68 56	27 58 55	48 45 46
66 34 52	48 42 34	67 33 47	39 46 67	84 77 55	52 49 35	26 57 82	49 33 57	88 46 44	54 29 67
55 37 45	78 44 53	25 29 60	36 54 74	59 44 55	87 27 23	64 48 32	35 56 45	52 29 43	29 29 70
22 29 50	56 35 42	37 54 36	68 33 55	78 67 33	49 25 42	85 38 76	45 56 40	37 26 68	66 44 52
56 57 50	48 25 44	67 34 37	29 55 62	78 43 55	66 27 44	37 37 22	59 44 57	73 28 83	44 56 40
67 35 42	39 42 36	78 37 57	77 44 54	55 66 38	26 48 77	52 29 22	37 45 28	53 38 45	79 52 50

Cor____ Inc____ Tot____

Name______________________ Date__________ Performance 2

77 53 50	46 44 47	53 38 73	38 47 63	57 66 48	88 43 57	62 38 62	29 57 38	47 84 46	84 57 55
55 47 36	76 55 44	58 34 57	78 44 62	67 55 38	36 67 57	56 38 74	78 54 58	75 76 36	48 44 74
35 36 46	57 44 56	68 54 37	77 35 64	46 55 75	36 57 62	59 74 27	78 45 58	88 23 64	73 38 73
67 44 50	58 35 73	47 44 64	67 28 55	73 48 36	45 66 72	36 35 25	55 47 46	87 54 66	57 44 64
56 55 50	34 37 44	45 58 37	68 23 65	79 44 72	74 66 38	25 39 46	44 47 55	37 27 67	63 37 63
68 46 56	49 44 47	73 27 63	35 38 62	48 55 37	78 33 58	56 36 73	62 49 89	27 74 76	58 33 57
27 57 57	35 36 46	46 48 53	76 67 34	58 44 67	76 65 56	87 54 25	69 33 34	84 28 56	39 37 72
56 78 56	48 55 47	79 34 53	68 37 45	57 45 42	55 26 82	34 38 30	62 59 56	34 77 38	64 36 55

Cor____ Inc____ Tot ____

Name____________________ Date__________ Performance 3

57 88 50	83 97 47	39 65 56	68 48 33	67 69 46	58 78 65	74 37 65	48 89 33	69 67 40	89 55 87
78 97 48	65 68 67	38 74 44	57 53 45	67 36 57	46 67 53	53 87 47	44 89 58	58 87 66	79 78 60
89 67 50	53 88 34	57 78 45	28 98 56	59 57 67	78 45 34	66 43 65	78 67 42	86 27 37	56 46 78
77 48 70	78 66 30	67 38 46	64 75 30	56 64 56	36 42 75	78 79 33	79 89 33	86 76 52	55 54 26
56 49 68	38 67 49	74 78 30	63 69 44	52 48 57	49 37 64	86 56 38	58 25 44	76 57 34	66 44 77
98 78 50	65 64 36	46 34 55	34 33 46	56 54 68	76 56 55	49 78 87	86 87 55	75 69 30	43 95 69
27 68 33	58 49 44	67 88 65	76 77 37	48 67 87	98 49 55	67 89 66	58 87 39	76 67 40	89 57 94
68 79 39	59 43 60	87 27 70	78 43 85	33 59 48	45 66 67	66 48 59	64 59 76	26 56 33	55 37 55

Cor____ Inc____ Tot ____

Name______________________ Date__________ Performance 4

48	56	62	37	56	44	27	39	66	37
34	56	28	37	55	37	58	43	24	35
35	65	57	64	35	47	55	22	45	34

47	67	26	55	39	76	45	34	52	47
36	54	35	37	76	56	77	57	39	53
44	53	56	47	62	28	56	49	73	40

89	56	47	35	53	26	57	64	45	37
67	35	34	74	48	38	57	29	46	77
58	32	40	25	55	36	32	54	43	65

68	59	89	78	34	54	42	46	37	56
55	32	42	53	37	48	59	66	46	39
45	56	28	65	53	37	68	59	64	37

68	59	89	99	35	46	57	43	26	53
53	22	22	34	46	45	24	68	57	48
24	34	54	63	45	27	65	38	65	48

66	37	68	79	89	44	53	62	37	66
47	35	22	34	42	36	48	69	46	55
42	35	57	64	87	36	58	44	53	72

59	78	33	64	27	69	87	54	36	44
56	32	38	47	29	55	46	87	66	67
36	52	76	48	67	35	54	30	65	38

67	49	78	55	24	43	72	56	38	74
55	33	25	38	59	48	69	77	43	77
52	37	56	48	75	93	36	47	22	35

Cor____ Inc____ Tot____

Name__________________________ Date___________ Performance 5

46 67 22	58 64 47	77 34 34	67 24 45	36 37 36	57 44 45	65 55 77	54 47 45	28 88 62	39 57 33
56 44 67	38 55 45	57 24 63	68 36 46	39 74 82	77 45 36	55 48 50	45 36 55	52 28 43	35 48 54
56 46 32	47 43 45	78 22 63	65 37 52	35 56 37	42 38 65	28 53 44	69 28 56	85 45 73	45 37 44
48 42 53	34 37 72	57 44 36	68 54 44	79 22 57	23 38 82	47 46 37	67 55 40	45 47 73	83 27 26
67 25 33	48 33 22	77 43 52	36 35 26	54 47 27	26 66 35	52 58 47	38 55 55	89 33 48	99 62 50
57 55 63	34 28 54	56 35 73	87 44 25	29 64 45	38 43 63	57 47 92	48 52 33	57 36 44	77 55 62
47 66 52	68 32 35	68 36 46	57 45 73	65 56 65	44 37 53	25 48 45	43 57 56	37 74 67	69 33 82
57 56 56	48 73 74	67 44 56	73 58 34	46 64 26	26 36 58	58 44 33	89 33 55	85 27 40	44 69 60

Cor____ Inc____ Tot____

Name______________________ Date__________ Performance 6

58	77	94	58	39	88	53	38	45	72
56	77	83	36	89	42	75	84	35	88
72	45	38	40	40	62	36	37	58	70

68	63	48	79	82	50	83	56	77	54
48	48	98	74	35	39	74	77	42	29
69	45	60	70	47	33	47	58	48	40

38	78	63	58	79	87	75	45	36	89
68	93	47	59	52	37	47	75	86	90
40	47	58	33	43	26	58	58	67	44

67	73	48	79	82	33	45	78	89	48
44	47	32	58	87	63	34	28	67	84
58	64	34	55	88	34	65	30	40	70

68	45	73	59	78	65	53	39	68	66
74	76	79	57	68	85	48	95	55	89
57	70	48	44	55	35	58	64	67	72

74	78	67	34	53	52	34	67	89	99
45	47	44	78	23	38	45	74	63	30
22	36	47	43	46	40	75	66	33	44

26	78	76	56	45	43	65	98	78	64
56	78	89	80	87	78	45	43	34	33
70	44	44	77	40	60	56	72	34	58

97	78	64	35	26	42	35	67	84	56
54	75	68	34	64	66	76	39	78	60
78	43	44	26	48	56	60	40	50	68

Cor____ Inc____ Tot____

Name______________________ Date__________ Performance 7

66 55 45	89 33 37	45 27 65	62 48 45	37 56 87	63 38 69	54 56 56	48 64 34	88 44 26	59 53 53
47 56 45	78 54 36	89 37 54	55 45 23	72 28 63	53 77 76	37 56 55	56 34 88	44 69 34	99 53 76
78 53 45	56 45 73	44 57 56	77 54 27	52 39 67	34 56 53	43 67 44	78 44 35	99 32 52	40 39 67
97 45 33	56 54 78	45 27 56	42 39 45	36 65 52	57 26 36	66 37 47	33 58 67	54 77 38	27 64 56
67 54 34	59 32 54	89 22 67	34 37 83	52 48 92	36 57 67	57 75 48	66 39 76	37 66 45	88 44 33
66 45 45	49 58 63	87 63 52	67 25 34	39 34 45	78 55 76	55 27 43	27 49 27	39 99 33	78 45 62
99 22 42	56 36 46	37 55 57	62 48 87	28 56 65	45 66 45	63 38 36	45 46 57	78 33 44	56 55 66
67 45 42	43 67 37	52 49 58	36 57 76	44 29 33	68 36 25	92 49 44	36 77 65	78 33 44	66 26 22

Cor____ Inc____ Tot____

Name______________________ Date__________ Performance 8

33 55 46	58 26 30	39 54 50	68 33 38	52 49 62	69 36 33	74 46 85	37 55 40	33 27 70	26 55 47
22 69 40	58 43 36	93 85 53	49 48 37	57 30 55	82 58 48	58 27 79	55 48 37	36 73 36	29 44 47
68 47 50	35 64 43	64 35 54	27 44 70	49 55 42	79 83 30	83 40 59	77 58 55	55 22 88	66 32 76
77 56 47	56 37 63	48 53 47	95 47 58	37 28 75	58 46 62	66 59 35	72 29 65	29 47 78	48 63 39
57 58 36	38 33 40	87 36 58	64 87 74	36 49 33	49 44 27	87 37 36	66 85 58	37 57 37	52 39 46
68 54 66	46 37 70	77 54 48	59 26 83	88 27 32	36 49 42	54 47 36	35 57 52	47 39 74	62 59 44
28 46 40	36 28 66	78 44 32	59 35 53	88 54 52	74 38 56	33 49 48	56 87 76	52 38 45	39 59 39
67 54 30	48 25 62	39 37 47	87 26 86	66 58 25	27 55 42	46 38 36	75 56 75	55 66 83	99 32 42

Cor____ Inc____ Tot____

Name____________________ Date__________ Performance 9

57 53 60	48 26 84	85 37 37	72 49 56	36 75 64	44 48 67	87 37 34	67 43 56	35 48 72	23 69 44
78 54 44	56 37 37	37 38 62	59 83 84	27 46 59	33 58 68	47 27 74	84 36 33	72 48 44	46 56 64
38 55 55	57 43 35	66 47 42	79 58 26	88 49 47	46 36 66	36 45 53	52 48 38	24 57 47	83 47 55
77 56 40	48 35 65	99 22 47	56 47 62	45 48 53	53 68 48	37 38 92	56 56 37	68 75 46	84 37 53
57 35 46	38 45 73	57 63 36	26 37 25	44 57 35	58 44 64	94 37 85	58 38 72	83 57 39	72 59 44
22 49 43	36 37 75	44 58 33	88 33 44	57 36 27	64 48 75	36 35 65	59 44 42	88 33 28	75 45 47
95 47 50	48 33 82	73 69 36	36 47 58	58 44 44	77 36 67	44 47 30	36 55 56	52 38 44	25 47 82
64 48 60	78 33 74	66 65 63	35 48 52	29 55 38	73 47 57	48 55 64	82 59 57	39 36 33	44 47 65

Cor____ Inc____ Tot____

APPENDIX B

Reinforcement Menu

Reinforcement Menu

I would like to earn:

0 1 2 3 4 5 points for each:

10 20 30 40 50 correct answers.

I understand that I will soon be able to exchange my points for nickels at the rate of one nickel for each 20 points.

APPENDIX C

Daily Recording Form and Personal Point Record

Daily Recording Form

Name_________________________ Group___________ Phase_________

Date	Correct	Incorrect	Total	Pts Earned	Pts Spent	Item	Cum Pt Bal

Mean Rates: Cor____ Inc____ Tot____

Phase_________

Date	Correct	Incorrect	Total	Pts Earned	Pts Spent	Item	Cum Pt Bal

Mean Rates: Cor____ Inc____ Tot____

Personal Point Record

Name________________________ Group_________

Date	Points Earned	Cumulative Points Earned

APPENDIX D

Mean Rate-Correct Scores for All Subjects

Mean Rate-Correct Performance Scores for Group One

Subjects	Baseline	Token I	Extinction I	Token II	Extinction II
1	2.95	3.38	4.32	5.77	7.36
2	1.80	2.57	2.17	2.58	1.92
3	4.32	5.75	3.93	5.92	2.46
4	2.73	3.93	3.64	3.93	4.08
5	4.54	5.63	6.14	6.37	6.01
6	2.43	3.05	3.73	5.25	4.33
7	1.66	2.16	1.77	4.91	4.01
8	2.93	2.60	2.32	3.78	3.78
9	3.16	4.18	3.06	5.30	3.13
10	.81	1.93	.45	2.54	.97
11	1.00	1.21	1.65	1.71	1.24
12	1.35	1.14	2.08	2.70	1.46
13	3.31	4.47	4.13	6.22	7.58
14	1.96	2.75	2.20	1.98	3.30
15	2.61	3.48	2.73	3.02	2.37
16	1.53	1.71	1.62	2.42	2.00
17	2.18	3.27	3.22	3.55	1.55
18	3.70	4.21	3.82	4.84	2.61

Mean Rate-Correct Performance Scores for Group Two

Subjects	Baseline	Token I	Extinction I	Token II	Extinction II
1	2.94	4.03	3.30	3.91	7.36
2	1.34	1.10	1.72	1.66	1.92
3	1.26	1.57	2.34	2.62	2.46
4	.50	.87	1.63	1.96	4.08
5	2.04	2.55	2.48	3.66	6.01
6	2.88	4.32	4.46	6.31	4.33
7	3.57	5.46	5.20	5.48	4.01
8	1.84	2.47	1.60	3.20	3.78
9	1.00	1.42	.84	1.23	3.13
10	1.87	1.87	1.92	1.97	.97
11	1.43	3.04	2.68	3.40	1.24
12	3.03	4.02	3.33	3.43	1.46
13	1.35	1.83	1.57	2.61	7.58
14	2.08	2.46	2.54	3.16	3.30
15	3.18	4.57	3.90	5.26	2.37
16	4.07	5.14	5.25	6.16	2.00
17	5.26	6.51	8.14	9.68	1.55
18	3.26	3.74	3.87	5.48	2.61

Mean Rate-Correct Performance Scores for Group Three

Subjects	Baseline	Token I	Extinction I	Token II	Extinction II
1	2.67	4.12	4.48	5.64	4.93
2	3.71	5.96	7.15	9.55	9.81
3	2.26	3.31	3.13	4.37	3.67
4	.74	1.40	.83	3.72	1.00
5	1.74	2.31	1.56	1.28	.91
6	2.10	3.75	3.30	6.02	3.17
7	3.05	4.85	3.23	5.55	3.01
8	1.67	2.06	1.61	1.50	.90
9	2.84	3.46	2.88	4.63	3.57
10	1.30	1.03	.90	1.36	1.05
11	2.70	2.86	3.65	3.13	2.91
12	4.20	4.60	5.66	6.45	7.23
13	.43	.53	.65	1.48	.66
14	3.97	4.36	4.06	4.84	5.65
15	1.34	1.83	1.77	2.72	2.17
16	3.32	3.73	4.91	6.27	7.65
17	3.80	2.74	1.88	3.37	2.34
18	2.65	3.43	3.16	5.76	4.71

Mean Rate-Correct Performance Scores for Group Four

Subjects	Baseline	Token I	Extinction I	Token II	Extinction II
1	4.08	3.96	4.43	7.13	6.85
2	2.46	3.50	3.13	4.12	3.96
3	3.95	4.85	5.10	7.17	8.24
4	2.40	3.08	2.77	2.71	2.80
5	3.74	5.11	5.43	6.90	6.98
6	1.08	.75	.47	2.16	1.10
7	.65	1.44	1.92	2.02	1.23
8	2.74	2.85	2.06	4.62	2.98
9	1.52	4.62	4.62	5.24	5.50
10	1.38	2.02	1.73	2.77	1.75
11	2.17	2.01	1.26	1.84	1.38
12	3.91	5.96	6.46	7.35	7.48
13	2.26	4.50	5.18	6.24	6.55
14	1.53	1.72	1.64	1.85	1.47
15	2.94	2.62	3.06	4.18	5.33
16	2.10	2.76	1.62	2.60	1.90
17	3.98	5.91	4.62	6.82	5.28
18	1.98	2.91	3.42	4.50	5.21

APPENDIX E

Mean Rate-Incorrect Scores for All Subjects

Mean Rate-Incorrect Performance Scores for Group One

Subjects	Baseline	Token I	Extinction I	Token II	Extinction II
1	.21	.31	.24	.31	.46
2	.41	.38	.41	1.02	.68
3	.37	.32	.07	.14	.08
4	.07	.09	.08	.03	.04
5	.41	.62	.78	1.57	2.76
6	.14	.15	.20	.11	.28
7	.41	.36	.35	.73	.65
8	.26	.14	.15	.21	.22
9	.20	.33	.21	.21	.10
10	2.45	1.05	3.23	.32	.83
11	1.12	1.03	1.34	1.16	.47
12	.26	.64	.56	.35	.16
13	.25	.36	.15	.57	.64
14	.67	1.06	1.32	1.71	1.04
15	.52	.83	.96	1.55	1.33
16	.11	.14	.18	.26	.18
17	.43	.23	.44	.42	.16
18	.24	.18	.34	.26	.21

Mean Rate-Incorrect Performance Scores for Group Two

Subjects	Baseline	Token I	Extinction I	Token II	Extinction II
1	.55	.61	.30	.51	.12
2	.43	.25	.27	.30	.18
3	.25	.18	.62	1.25	.71
4	1.42	.22	.24	.30	.22
5	.73	1.02	2.56	1.54	3.49
6	.56	.38	.34	.20	.14
7	.10	.08	.16	.17	.15
8	.27	.13	.40	.28	.17
9	.05	.10	.02	.04	.04
10	.22	.33	.49	.26	.26
11	.63	.41	1.45	1.32	1.51
12	.22	.27	.43	.51	.24
13	.58	.44	1.00	1.54	1.22
14	1.58	1.14	1.05	.82	.86
15	.60	.76	.48	.88	1.10
16	.40	.49	.24	.53	.61
17	.22	.18	.21	.28	.62
18	.71	.87	1.20	1.25	.80

Mean Rate-Incorrect Performance Scores for Group Three

Subject	Baseline	Token I	Extinction I	Token II	Extinction II
1	.17	.13	.08	.22	.28
2	.15	.33	.57	.48	.44
3	.36	.26	.28	.27	.25
4	.94	.76	.36	.23	.36
5	.45	.73	.58	.27	.23
6	.21	.30	.20	.60	.34
7	.20	.21	.25	.34	.23
8	.53	.52	.27	.23	.48
9	.78	.73	.60	.55	.45
10	.74	.28	.28	.31	.21
11	.43	.25	.46	.56	.47
12	.42	.44	.20	.65	.63
13	1.41	1.06	1.19	.35	1.32
14	.06	.14	.61	.16	.16
15	.17	.15	.55	.31	.26
16	.21	.35	.16	.55	.87
17	.26	.20	.53	.31	.14
18	.15	.75	.15	.17	.24

Mean Rate-Incorrect Performance Scores for Group Four

Subject	Baseline	Token I	Extinction I	Token II	Extinction II
1	.32	.34	.33	.68	.71
2	.15	.21	.23	.24	.51
3	.38	.12	.13	.13	.24
4	.30	.17	.13	.09	.11
5	.38	.32	.45	.64	.53
6	.51	.36	.53	.37	.17
7	.24	.36	.31	.35	.20
8	.75	.87	.52	.41	.22
9	1.92	.93	.53	.62	.62
10	.11	.14	.13	.12	.10
11	.05	.08	.28	.07	.03
12	.29	.44	.61	.57	.60
13	1.12	.75	2.03	2.46	2.09
14	1.38	.36	.47	.38	.31
15	.21	.27	.28	.30	.15
16	.65	.53	.23	.42	.25
17	.44	.67	.73	.65	.90
18	.20	.18	.16	.28	.54

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BIOGRAPHICAL SKETCH

Jeffrey Francis Kanov was born February 20, 1943, in Brooklyn, New York. He attended public schools in Brooklyn, New York, Miami Beach, and North Miami, Florida, and was graduated from North Miami High School in 1960.

From 1960 to 1965, he attended the University of Florida, Miami-Dade Junior College, and the University of Miami, where he received the degree of Bachelor of Arts. In 1965, he enrolled in the University of Florida, where he received the degree of Master of Rehabilitation Counseling in 1966. From 1966 to 1970, he has worked as a graduate assistant in the College of Education at the University of Florida while pursuing his work toward the degree of Doctor of Philosophy. From 1970 until the present time, he has been employed as a school psychologist in the Dade County Public School System in Florida.

Jeffrey Francis Kanov is single. He is a member of Phi Delta Kappa, the National Rehabilitation Association, the Dade Association of School Psychologists, and the Council for Exceptional Children.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Wm D Wolking

William D. Wolking, Chairman
Associate Professor of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Myron Cunningham

Myron A. Cunningham
Professor of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Cary L. Reichard

Cary L. Reichard
Assistant Professor of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Audrey S. Schumacher

Audrey S. Schumacher
Professor of Psychology

This dissertation was submitted to the Dean of the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August, 1972

B. L. Sharp by M C Baller

Dean, College of Education

Dean, Graduate School